



Caution:

Please read this Manual thoroughly.

If you do not understand or are unsure of any information contained in this Manual please contact your Agent or BIOQUELL for clarification.

OPERATING MANUAL

ASTEC EDU 96 MOBILE FUME CUPBOARD (TM160-O&M-001- Revision 3)



part of BIOQUELL (UK) Limited

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

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Revision 3

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Important, please read this manual before using this equipment.

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1 INTRODUCTION

The Astec EDU 96 Mobile Fume Cupboard (Fig. 1), is a recirculatory type unit that has been designed for use in school laboratories.

The Astec EDU 96 Mobile Fume Cupboard, when fitted with a Filtrete pre-filter, an EDU carbon filter and operated with the front glazing fully down, conforms to the requirements of DFE Design Note 29 and Buildings Bulletin 88, Fume Cupboards in Schools. This product has been tested and approved by CLEAPSS. It will satisfactorily absorb the substances released in normal educational science activities, up to A-Level, namely those listed in Section 10.



Figure 1 Astec EDU 96 Mobile Fume Cupboard

THE FUME CUPBOARD FITTED WITH THE FILTERS DESCRIBED ABOVE WILL NOT ABSORB HYDROGEN, CARBON MONOXIDE, METHANE OR THE NITROUS OXIDE.

Filters have a high efficiency but, because the nose is very sensitive, the residual gases passing through the filter may sometimes be smelt, even though their level is not hazardous. However, should they cause distress, the operation should be finished and the filter saturation monitored.

Users releasing hazardous vapours or gases not normally used in science education up to A-Level or unusually large quantities of substances normally used in school science up to A-Level, must make their own assessment as to whether it is safe to do so.

Similarly, if this fume cupboard is fitted with a filter different from that named above, users must make their own assessment as to its efficiency.

The EDU has the following specification:

Size (W x D x H): 980 x 700 x 1790mm

Weight: 160kg

Power: 600w

Current Drawing: 2.6Amps

Noise : <50dB (A)

2 INSTALLATION

WARNING:
INSTALLATION SHOULD ONLY BE CARRIED OUT BY TRAINED AND APPROVED ENGINEERS OR AGENTS.

ASTEC MICROFLOW OR ITS AGENTS CANNOT ACCEPT RESPONSIBILITY FOR DAMAGE, LOSS OR INJURY CAUSED BY, OR RESULTING FROM, INCORRECTLY INSTALLED EQUIPMENT.

The units are supplied ready assembled and complete with a mains plug. They only require assembly of the filters.

The plug is fused with a 5 Amp fuse.

2.1 SERVICES (IF FITTED)

Refer to Fig. 2.

2.1.1 Drains

The cabinet is supplied with a 1.5" Vulcathene hose to the bottle trap. The other end is connected to a drain inlet position on the wall. There is an adapter supplied with the hose and drain outlet can be 1.5" BSP FEMALE or 1.5" VULCATHENE FEMALE.

The drain outlet should be supplied with a cap for use when the cabinet is disconnected. The drain inlet position should be as low as practical to allow fall from cabinet drip cup to drain. As an alternative the hose may be connected to a container or surface drain. Care is required to empty the hose prior to disconnection.

2.1.2 Water

The tap is connected to a blue hose terminating in a quick release fitting. The body of the quick release fitting is connected to a 0.25" BSP MALE OUTLET point on the wall.

2.1.3 Gas

A Gas Board approved tap and stainless steel reinforced metal hose and quick release fitting are provided for connection to a 0.125" BSP MALE OUTLET point on the wall. The installation must be checked by an approved engineer.

Further quick release fittings for multiple point use can be supplied to order.

2.1.4 Electrics

An electric socket is located on the top left-hand side of the unit. Only electrical items requiring 2 Amps or less should be plugged into the unit.

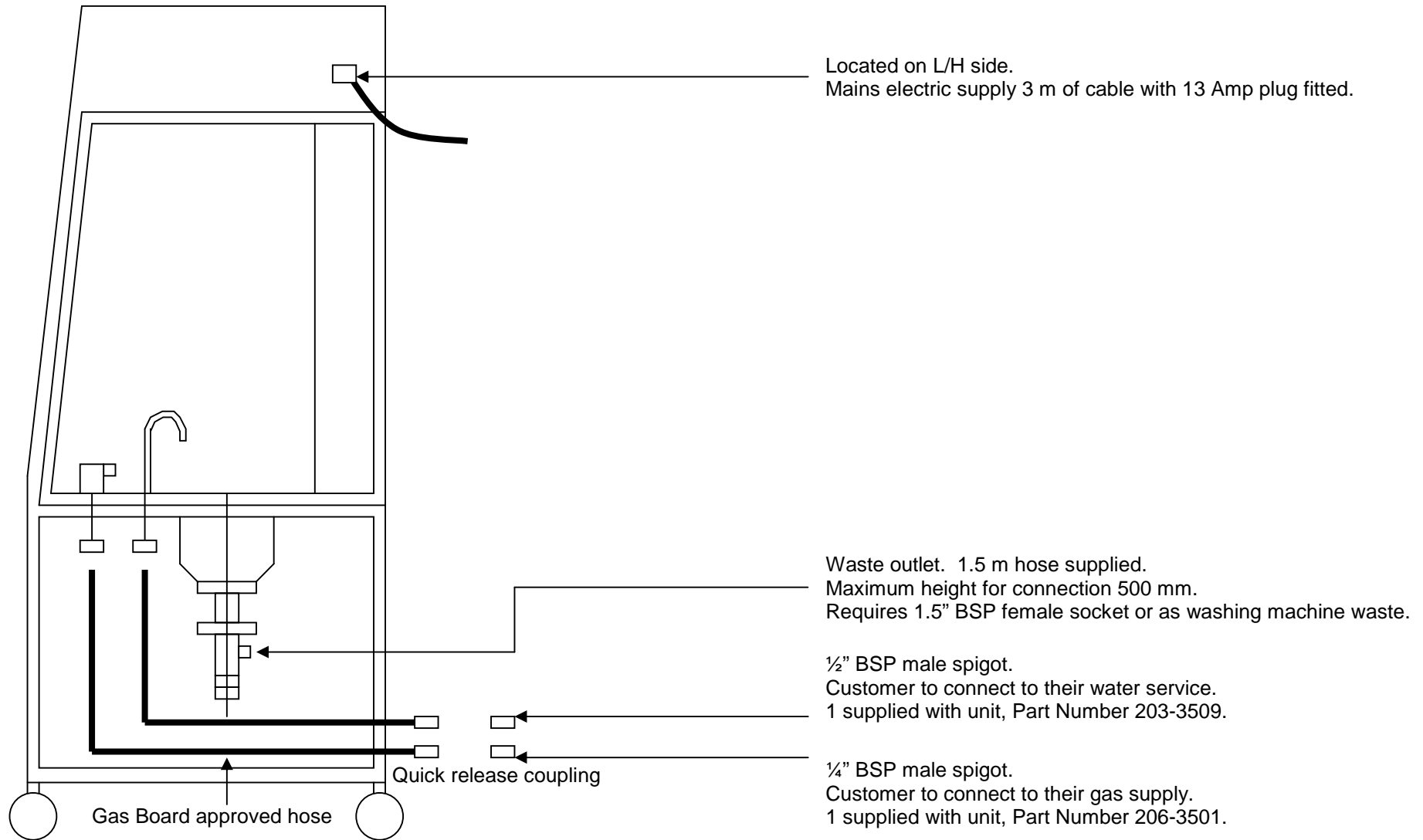


Figure 2 EDU 96 Services - Right Hand Side View

2.2 FITTING OF FILTERS

The filter and pre-filter will be supplied separately and should be fitted in accordance with Section 3.

2.3 GENERAL INSTALLATION RECOMMENDATIONS

To avoid air currents in the room affecting the performance of fume cupboards, British Standards BS 7258, Part 2 1990, Design Note 29 and Buildings Bulletin 88 make the following recommendations:

Units should be sited so that the airflow into the front aperture is not hindered by walls, other fume cupboards cross draughts etc. In particular, any wall in front of it should be positioned so that the effects of doors and windows in producing cross draughts are minimised. Ideally, the face velocity should be measured and the variation checked in all sites likely to be used, under the conditions of ventilation likely to be relevant.

The fume cupboard should never be sited where it blocks an escape route.

2.4 MONITORING

The unit will require regular monitoring for airflow and filter condition. This should be carried out every fourteen months in order to comply with COSHH Regulations. The monitoring procedure is described in Section 6.

3 FITTING AND REMOVAL OF FILTERS

For schools use an EDU filter should always be used.

Hazards associated with the removal and disposal of filters will depend on the use to which the filtration fume cupboard has been put. In a normal schools situation the filter can be removed in the laboratory. Plastic gloves and a strong plastic bag are supplied with each filter. Plastic gloves should be used when handling dirty filters and the filter should be put into the strong plastic bag and sealed prior to disposal. The ideal method of disposal is incineration, but if this is not possible, the filter should be double bagged, well sealed and put in the domestic waste.

The filter access panel is mounted on the front left hand side of the cabinet and is removed using the 180° turn fasteners.

3.1 MAIN CARBON FILTERS

The multi-layer activated carbon filter for schools is supplied separately in a plastic wrapping. The filter has a foam rubber seal on its upper face around the edge and this seal must not be damaged or missing.

To install/change filter:

- (a) Open the access door, remove carefully and undo the earth strap.
- (b) Pull the clamping handle across the unit from right to left. This will automatically release the clamping bars.
- (c) Slide the filter out and place in a plastic bag ready for disposal.
- (d) Insert the new filter in the unit with the foam rubber seal uppermost and slide into position against the back stop.
- (e) Re-clamp the filter by moving the handle from left to right into the unit.
- (f) Rest the new pre-filter on top of the filter between the clamping frame ensuring the carbon filter is covered.
- (g) Replace the door and earthing strap.

3.2 PRE-FILTER

The pre-filter is a white electrostatically charged Filtrete which sits on top of the main filter. To change the pre-filter, open the filter access door, taking care to undo the earthing strap, remove the pre-filter. Place the new pre-filter on the main carbon filter and replace door making sure the earthing strap is reconnected.

4 GENERAL OPERATING INSTRUCTIONS

- 4.1 The fume cupboard is fitted with a filter for use on schools curriculum. If the cabinet is to be used for any other purpose, please consult Astec Microflow (BIOQUELL UK) for suitability of filter. Many different types of filter are available for specific purposes.
- 4.2 The EDU 96 will start at the normal operating speed at switch on.
- 4.3 The airflow and filter saturation should be checked on a regular basis. Appendices 3 and 4 gives details.
- 4.4 A Bunsen burner should not be placed too close to the side or back panels (<150 mm). The Bunsen burner or other heat source should be positioned away from the back baffle screen. Flame height should not exceed 100 mm. Bunsen burners should only be lit when the fan is switched ON.
- 4.5 The spillage tray is manufactured from glass reinforced plastic and has a chemically resistant gel coat though any chemical spillage's should be removed from the surface as soon as possible.
- 4.6 It should be noted the Activated Carbon filter blocks do NOT absorb carbon monoxide/hydrogen or nitrogen oxides. However, small quantities (such as used in schools) will not present a hazard due to the large dilution effect of the airflow through the unit and retardation of the fumes in the filter matrix.
- 4.7 Astec fume cupboards are designed to handle fumes and vapours given off during normal laboratory procedures. It is not recommend that large quantities of acid or solvents are boiled off in the fume cupboard.
- 4.8 Spare pre-filters should always be kept available and preferably a main filter. The activated multi-layer carbon filter used for normal school use will last for a number of years. It is a requirement under COSHH regulations that ventilation equipment is checked every 14 months for safe operation and further information is supplied in Appendix 1.
- 4.9 High concentrations of fumes entering the filter block may temporarily reduce the filtration efficiency. For this reason any major spillage within the fume cupboard should be cleared up immediately, preferably using spillage absorption granules, rather than tissue paper, which may aggravate the evaporation of toxic fumes from the spillage area.
- 4.10 Following a major spillage the main filters must be stabilised, as the heat of wetting may reduce filter efficiency. After stabilisation, the old filters can normally be re-used, provided saturation has not been reached. A guide is not to use the cabinet for several hours and then to run the cabinet without any chemical fumes for 2-3 hours. Check the exhaust for the presence of the spilled chemical with chemical detection tubes.

- 4.11 The electrical equipment in the cabinet including light fittings and control equipment are in separate enclosures, which are ventilated with fresh room air. The equipment should not be used in a flammable room atmosphere.

5 CONTROL PANEL

The features of the Control Panel are shown in Fig. 3.

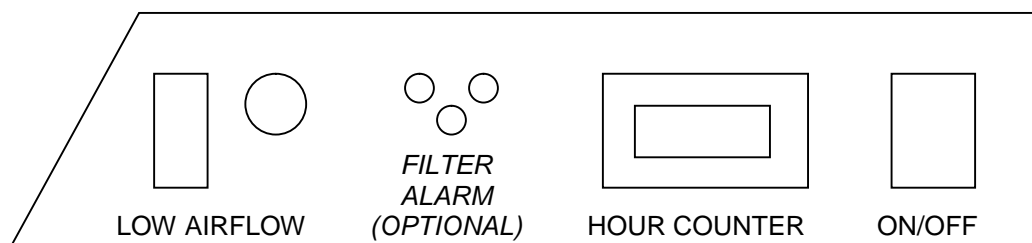


Figure 3 Control Panel Features

5.1 MAINS ON/OFF

Press the switch down to switch on. A green indicator lamp will indicate that power is connected to the unit. The fan will run at full speed, ready for normal operation of the fume cupboard and the lights, if fitted, will come on. The cupboard can be used immediately.

5.2 HOUR COUNTER

This indicates the total number of hours running time of the fan.

5.3 LOW AIRFLOW ALARM

The alarm is a red light located at the front of the unit. In normal operation, the red light will not come on.

If the red indicator lamp starts to flashes on intermittently or stays on, the pre-filter is starting to block with dust and an airflow reading should be taken at the aperture to determine if the pre-filter requires changing. We advise changing the pre-filter if an airflow of 0.3 m/sec cannot be maintained.

The correct operation of the alarm may be tested as described in Appendix 3, instructions on replacing filters are given in Section 3 of this manual.

5.4 FILTER ALARM/STATUS (IF FITTED)

The green LED is constantly displayed while the filter is actively absorbing the chemical fumes. The LED goes out every six seconds as the mechanism samples the air stream. When a chemical breakthrough is detected the red LED comes on intermittently and an audible alarm bleeps 4 times every minute showing the filter requires changing. See Appendix 4 for calibration and testing.

5.5 ACID DETECTION SYSTEM (IF FITTED)

A simple optional detector system for inorganic acid gases can be fitted to the fume cupboard.

The green LED will indicate the absence of acid gases, and a red LED will alert the user to acid fumes in the return air to the laboratory, an audible alarm will also sound.

5.6 TESTING THE ACID DETECTOR ALARM

The alarm can be simply checked by removing the indicator paper from the holder as follows:

- (a) Switch on the unit, the green LED should be on.
- (b) Open right-hand cupboard door.
- (c) Slide the cover off the detector.
- (d) Remove the indicator paper. The green LED should go out, the red LED will come on and the alarm sound.
- (e) Insert the detector paper, green light should come back on.

6 MONITORING

6.1 GENERAL

Under the “Control of Substances Hazardous to Health” (COSHH) regulations, it is mandatory to check ventilation equipment at “suitable intervals” for correct operation. A suggested maintenance schedule and record sheet are given. This section of the manual reviews manual methods of filter condition and airflow monitoring.

The purpose of monitoring is to detect when the pre-filter or main filters cease to operate effectively. If the pre-filters are blocked, the airflow will be reduced at the fume cupboard aperture. If the main filters are saturated they will cease to remove the fumes effectively.

The EDU 96 is fitted with a low airflow alarm as previously described.

Airflow measurements should be made occasionally, preferably once a term, to check the face velocity, as described below.

Monitoring for filter saturation should be carried out at least once a year, preferably once a term, as described below.

If an odour is noticed, it is sensible to check the fume cupboard. However, it must be remembered that the sense of smell is very sensitive for some chemicals (e.g. Ammonia or hydrogen sulphide) and a slight smell does not mean that the exhaust levels of chemicals have approached the maximum acceptable concentration.

6.2 AIRFLOW MEASUREMENTS

An anemometer should be used to check the airflow (face velocity) at the working aperture. Any suitable anemometer may be used, including hot wire or vane anemometer. A minimum of nine readings should be taken across the working aperture, as shown on the record sheet. Note the results on the record form. If the airflow drops below 0.3 m/sec it is mandatory to record this data.

A low cost vane anemometer is available from Astec Microflow (part number MOG-002). This will indicate the airflow has not altered greatly from the value obtained at the annual test when a calibrated, more accurate anemometer should be used.

RECORD FORM

Employer.....
Fume Cupboard Annual Examination Record

School/College:

Location of fume cupboard:

Airflow meter used:

a	b	c
d	e	f
g	h	i

DATE	READING IN THE 9 CELLS (m/s) AT MAX. OPENING									AVERAGE (m/s)	DROP >10% FROM LAST YEAR?	DO FILTERS PASS SUPPLIER'S TESTS?	SMOKE TESTS AIRFLOW INWARDS?	ANY DETERIORATION OR DAMAGE?	SIGNATURE OF TESTER
	a	b	c	d	e	f	g	h	i						

6.3 FACE VELOCITY MEASUREMENTS

6.3.1 Procedure

- (a) Imagine the face of the fume cupboard divided into nine cells. Stand as far as practicable from the fume cupboard with the anemometer sensing head in the plane of the sash and take airflow readings at approximately the centres of the nine cells.
- (b) Record for each cell the approximate average reading over a period of at least ten seconds, applying any correction from the calibration chart. Air movement fluctuations in the laboratory often make this quite difficult and it may be necessary to take a reading which averages over a longer period.
- (c) Look at the table and repeat any reading which seems to be very different from the general pattern. Record the average of this and the previous reading.

6.3.2 Calculation

6.3.2.1 Minimum Face Velocity

Record which of a,b,c,d,e,f,g,h,i is the smallest, i.e., record the minimum face velocity.

Is it above or below 0.3 m/s^{-1} ? If below, the fume cupboard FAILS.

6.3.2.2 Variation

(Useful for checking if sites are suitable)

Add a,b,c,d,e,f,g,h,i and divide by 9 to get the average.

Find the biggest and smallest out of a,b,c,d,e,f,g,h,i.

Work out: biggest minus average. Divide the answer by the average and multiply by 100 to obtain the upper percentage variation.

Work out: average minus smallest. Divide the answer by the average and multiply by 100 to obtain the lower percentage variation.

Is each of these less than 30%? If not, the site of the fume cupboard is not suitable. Is the failure due to cross draughts, the nearest of walls etc.

6.3.3 Manual Filter Saturation Detection

The filter of a recirculatory fume cupboard is able to absorb different types of gases, e.g. Acidic, alkaline and organic, but as it approaches saturation, significant quantities of the gases pass into the laboratory atmosphere. As there are strict guidelines to the amounts of hazardous gases within an enclosed area, it is necessary to test the efficiency of the filter at least once a year.

The general procedure for these tests involves releasing a gas, e.g. sulphur dioxide, inside the fume cupboard at a known rate and comparing that rate with the concentration of gas in the air coming out of the exhaust. This concentration is measured with a gas detector tube, a special pump being used to suck through it a known volume of air; the length of a colour change within the tube indicates the concentration of the gas in that sample of air.

Make sure that you know where the exhaust to the fume cupboard is situated, so you can gain easy access. A Gastec pump and suitable gas detector tubes are available from Astec Microflow.

When CLEAPSS developed saturation tests for these fume cupboards, the HSE accepted a test for acid gases.

6.3.3.1 Tests for Saturation by Acidic Gases

The original test (para 6.3.3.1 [b]) used sulphur dioxide from a canister. Because sulphur dioxide canisters have become harder to obtain, an alternative method of producing this gas (para 6.3.3.1 [a]) was devised by CLEAPSS, namely to burn sulphur itself on a flat porcelain dish.

An investigation was carried out to find if there was an agreement in results between the cylinder method and burning sulphur method. This proved to be the case within the limits of accuracy of the measurements, provided, (a) the Bunsen burner was switched off once the burning of sulphur commenced and (b) the apparatus was sited as far forward in the fume cupboard as possible, as shown in Fig. 4.

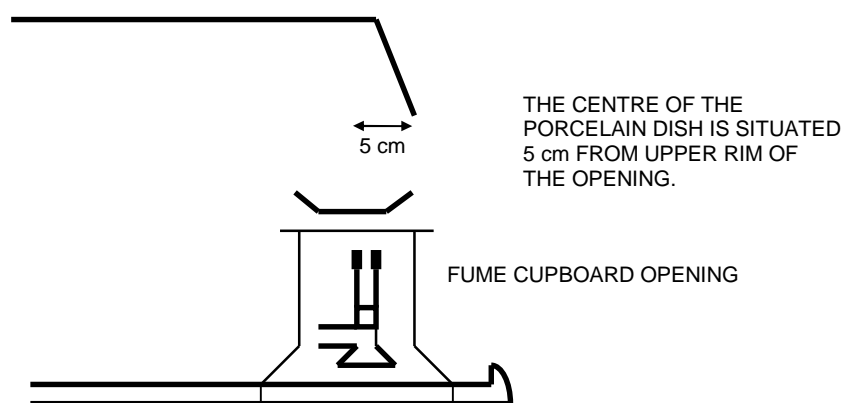


Figure 4 Apparatus Set-up

(a) Method Using Burning Sulphur

Items required are powdered roll sulphur (150-200 g), a flat bottom porcelain evaporating basin ¹, a gas detection kit ², a balance, a stop clock, a Bunsen burner, two gauzes both with ceramic circular centres, a tripod, heat-proof mat and a ruler. Wear eye protection.

Sulphur dioxide is a toxic gas, so do not breathe it in.

1 Available from Philip Harris Cat. No. C14485/2 (75 mm diameter x 20 mm)

2 Use a Gastec pump with sulphur dioxide tube 5L6 (low range) available from Astec Microflow.

Powder roll sulphur in a mortar with pestle.

Fill a flat-bottom porcelain basin with the sulphur so that it is level with the rim.

Weigh the porcelain basin, tripod and *other* gauze on a heat-proof mat *5 cm from the upper rim of the opening (see Fig. 4)*. (This places the sulphur in the maximum incoming draught and encourages complete combustion).

Place the basin with the sulphur on the tripod and gauze.

Switch on the fume cupboard.

Set the Bunsen alight with the gas tap half open and the collar open enough so that the flame is non-luminous. (The incoming draught may require you to place the burner a little more forward than under the centre of the basin; see Fig. 4).

The sulphur melts slowly to a pale amber liquid. Extreme care is now required not to knock the tripod base with your hands or the Bunsen burner; molten sulphur can cause severe burns. Remove the Bunsen burner from under the gauze and open the collar so it is half open. Place it back under the gauze very carefully. (The liquid will quickly darken. Changes in the appearance of the liquid surface indicate that burning is about to start. Sulphur catches light with a blue flame.)

Start the stop clock when half of the surface of sulphur has caught alight. Immediately switch off the Bunsen burner at the gas tap. (The flame has two coloured areas, the inner brown flame of incomplete combustion and the outer blue flame of complete combustion. Switching off the Bunsen burner causes the area of brown flame to diminish leaving the blue flame).

After 60 seconds, take a reading of the concentration, the sulphur dioxide being emitted through the exhaust with a gas detection kit. (A slight smell of sulphur dioxide should be ignored, but if the exhaust gas causes breathing difficulties, stop the test. The filter is obviously inefficient!)

Place the other gauze (which had been used in the weighing) on top of the basin and stop the clock, noting the time (in seconds). The gauze puts out the flame but some sulphur condenses onto it, which is why it should be included in the weighing).

When the sulphur has cooled down (allow 20 minutes) and solidified, re-weigh the basin, the remaining sulphur and the gauze (M_2).

The sulphur and dish may be kept and used the next time the test is carried out. A little more powdered roll sulphur may need to be added to make up and lost in the previous burning

Calculation

$$\text{Rate of sulphur dioxide released} = \frac{(M_1 - M_2 \times 750 \text{ cm}^3 \text{s}^{-1})}{t}$$

Now check your results with Table 1 in para 6.3.3.1 (c).

(b) Method Using a Sulphur Dioxide Cylinder

You will need a gas detection kit, a sulphur dioxide canister (TOXIC), a balance, a stop clock plus the glassware shown in Fig. 5. *Wear eye protection. Sulphur dioxide is a toxic gas, so do not breathe it in.*

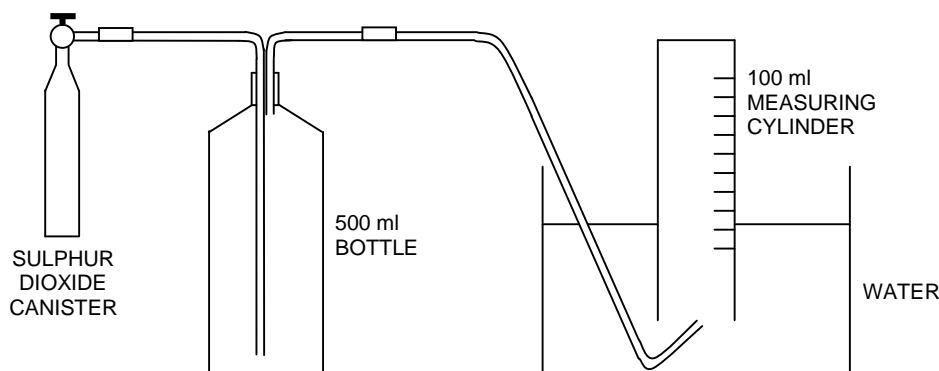


Figure 5 Sulphur Dioxide Method

- (i) Find the mass of the sulphur dioxide cylinder (M_1).
- (ii) Set up the apparatus, as shown in Fig. 5, in the fume cupboard. Switch the fume cupboard on.
- (iii) Open the valve on the gas canister very slowly. When bubbles appear in the measuring cylinder, start the stop clock. Adjust the valve so that 100 ml of gas bubbles into the measuring cylinder during a period of between 10 and 20 seconds.
- (iv) Without touching the valve, disconnect the cylinder from the apparatus.
- (v) After 60 seconds take a reading of the concentration of sulphur dioxide in the exhaust gas with the gas detection kit. (A slight smell of sulphur dioxide should be ignored, but if the exhaust gas causes breathing difficulties, stop the test. The filter is obviously inefficient)!
- (vi) Close the valve on the gas canister and stop the clock, noting the time of the run (in seconds).
- (vii) Find the mass of the sulphur dioxide cylinder (M_2).

Calculation

Rate of sulphur dioxide released from the cylinder =

$$\frac{(M_1 - M_2) \times 360 \text{ cm}^3 \text{ s}^{-1}}{t}$$

Now check your results with the Table 1.

(c) Filter Efficiency

Compare your level of the rate with the concentration of sulphur dioxide in the exhaust gas. If the concentration of sulphur dioxide is greater than the value in the table, then a new filter is required (this assumes that the efficiency of the filter has fallen to 98% for sulphur dioxide; at this level the fume cupboard will still not emit a dangerous level of gas in a well-ventilated laboratory).

Table 1 - Sulphur Dioxide Released and Concentration in Exhaust Gas

RATE OF SULPHUR DIOXIDE RELEASED (cm^3s^{-1})	CONCENTRATION OF SULPHUR DIOXIDE IN THE EXHAUST GAS (ppm)
5	1
10	2
15	3
20	4
25	5
30	6

7 MAINTENANCE

Under the “Control of Substances Hazardous to Health” (COSHH) regulations, effective from 1st October 1989, it is mandatory to maintain written records of checks, test and repairs carried out on safety equipment, and these records must be kept for 5 years. A summary of COSHH regulations are provided in Appendix 1.

Regular maintenance will reduce the possibility of hazard to the operator and prolong the life of the fume cupboard.

WARNING:
BEFORE ATTEMPTING ANY INSPECTION OR REPLACEMENT OF ELECTRICAL COMPONENTS IN THE HEAD ASSEMBLY, ALWAYS ISOLATE THE FUME CUPBOARD FROM THE MAINS ELECTRICITY SUPPLY.

7.1 AIRFLOW

The airflow indicator light will alarm the user to a low airflow situation.

This alarm should be tested and recalibrated if necessary, once a year as described in Appendix 3.

It is advisable to manually check the airflow using an anemometer as previously described.

7.2 FILTER SATURATION

This should be tested as previously described at least once a year, preferably every term.

7.3 CLEANING AND INSPECTION

7.3.1 6 Monthly

The following procedures should be carried out at six monthly intervals:

- (a) Remove the spillage tray (where fitted) and wash in dilute detergent solution.
- (b) Wash the interior surface of the cupboard with dilute detergent solution.
- (c) Inspect the cupboard frame and panels for mechanical damage.
- (d) Inspect the fan assembly for correct running by opening the bottom left front panel.
- (e) The rear airflow distribution screen can be removed for cleaning if required through the front aperture after removing the fixing screws.

7.3.2 12 Monthly

The following checks should be carried out at 12 monthly intervals:

- (a) Check the condition of services to the cupboard, including water supply, drip cup, waste drain (where fitted), gas supply (where fitted) and electrical cable and plug.
- (b) Check the condition of the filter and pre-filter.

7.3.3 24 Monthly

The following checks should be carried out at 24 monthly intervals.

The electrical earthing and insulation should be inspected by a qualified electrician.

WARNING:

BEFORE ATTEMPTING ANY INSPECTION OR REPLACEMENT OF ELECTRICAL COMPONENTS IN THE HEAD ASSEMBLY, ALWAYS ISOLATE THE FUME CUPBOARD FROM THE MAINS ELECTRICITY SUPPLY.

Electrical components are mounted on a plate in an electrical enclosure which is isolated from the airflow through the fume cupboard and is separately vented to room air. Access to the electrical enclosure is through the cover on top of the unit.

Some possible problems and their causes are shown below:

- (a) Unit will not operate, no lights or airflow:
 - (i) Check that the unit is plugged in and switched on.
 - (ii) Check the fuse in the mains supply or the plug (where fitted).
 - (iii) Check the fuses or circuit breakers in the head unit. The fuses or circuit breakers are located next to the mains cable inlet.
- (b) Unit operates, but one or both fluorescent lights do not come on:
 - (i) Check the circuit breaker.
 - (ii) Change the fluorescent light tube.
 - (iii) Replace the starter lamp in the electrical enclosure.
- (c) Fan does not operate, but the lights come on:
 - (i) Check the circuit breaker.
 - (ii) Change the motor start capacitor in the electrical enclosure.
 - (iii) Motor failure - call Astec Microflow or local Service Engineer.
- (d) Fan operates initially, but then cuts out. Lights remain on.

Motors are fitted with a thermal cut-out device, which will operate if the motor temperature rise exceeds 95°C. The most likely cause of overheating is a blockage of the airflow, either at the filters or at the exhaust outlet at the bottom of the unit.
- (e) The red indicator lamp comes on at switch on and stays on:
 - (i) The filter is not sealed correctly in the unit. Check the filter gasket is sealed correctly.
 - (ii) The fan has failed.
 - (iii) The alarm is malfunctioning see Appendix 3.

- (f) The red indicator lamp comes on at switch on, goes off, then comes on again.
 - (i) The pre-filter is blocked with dust.
 - (ii) If replacement of the pre-filter does not cause the light to stay off, then the low airflow alarm requires recalibration, as described in Appendix 3.
- (g) The red indicator light does not come on at switch on.
 - (i) The alarm requires recalibration, as described in Appendix 3.
 - (ii) If the fault persists after recalibration, there is a circuit failure.

9 FILTER TYPES

9.1 PRE-FILTERS

Filtrete pre-filter

This is a high performance pre-filter, designed to remove particulates from the air stream. The filter material is based on electrets, which are permanently charged di-electrics. They remove particulates from polluted air by strong electrostatic forces generated by the fibres from which they are made.

The combination of strong electric charges and open structure provides a filter with high efficiency, low airflow resistance and high loading capacity. Measured efficiency figures for particles in the 0.5 - 2.0 micron is 99%, with loading capacities up to 113 g/m². Filtrete will remove fine particles, aerosols and mists.

9.2 MAIN FILTERS

A specially formulated activated carbon filter is produced for Schools use. The filter is manufactured with layers of carbon, which have been impregnated with chemicals for the neutralisation of specification fumes in the schools curriculum. Typical efficiency guides of the filters are included in Section 10.

9.3 OTHER FILTERS

Other types of filters are available from Astec Microflow, after consultation with Astec Microflow on the intended use.

10 CHEMICAL APPLICATIONS

The multi filter is suitable for the chemical fumes released during normal school activities. This includes:

<u>CHEMICAL</u>	<u>TYPICAL EFFICIENCY %</u>
Ammonia	96
Sulphur Dioxide	98
Chlorine	98
Ethanol	99
Ethoxyethane	99
Methanol	99
Hydrogen Sulphide	97
Trichloroethane	99
Carbon Tetrachloride	99
Bromine	98
Sulphuric Acid	99
Hydrochloric Acid	99.5
Trichloroethylene	99

The filters are suitable for use with a wide range of other chemicals and advice for specific application is available from Astec Microflow. Chemicals generally used in schools for which the filters are suitable include:

ORGANIC

aluminium chloride and bromide
ammonia
ammonium chloride fumes
bromine
chlorine
chromium (VI) dichloride dioxide
(chromyl chloride)
hydrogen sulphide
iodine
iodine chlorides
lead fumes
lead bromide fumes
mercury and its compound
nitric acid vapour
nitrogen oxides
phosphine
phosphorus chlorides and bromides
phosphorus oxides
silicon tetrachloride
sulphur chlorides
sulphur dioxide
thionyl chloride
tin (IV) chloride
titanium tetrachloride
zinc chloride fumes

INORGANIC

acid amides
acid anhydrides
acid chlorides
acidic nitrogen oxide
alcohols
aldehydes
aliphatic hydrocarbons
aromatic amines and aromatic hydrocarbons
aromatic nitro compounds
carboxylic acids
esters
ethers
ketones
nitriles
organo halogens
phenols
pyridine

Dusts, etc.
dyes
enzymes
smoke

IT WILL NOT ABSORB HYDROGEN, CARBON MONOXIDE, NITROUS OXIDE OR METHANE

APPENDIX 1 - NOTES ON COSHH REGULATIONS (UK ONLY)

- 1 The "Control of Substances Hazardous to Health" (COSHH) regulations, effective from 1st October 1989.
- 2 The regulations are the UK implementation of an EEC Council Directive 80/1107/EEC.
- 3 The regulations require an employer to protect his employees and any other people (whether working for him or not) from hazardous substances.
- 4 A hazardous substance is defined as:
 - (a) A substance that is on the list of hazardous substances as defined by the Classification, Packaging and Labelling Regulations 1984 (b).
 - (b) A substance for which an Occupational Exposure Limit (OEL) value exists. This list is similar to US Threshold Limit Value levels (TLV).
 - (c) A micro-organism which creates a health hazard.
 - (d) Dust at a substantial concentration in air.
 - (e) Any substance which creates a hazard to health, similar to the hazards created by the substances in (a) to (d).

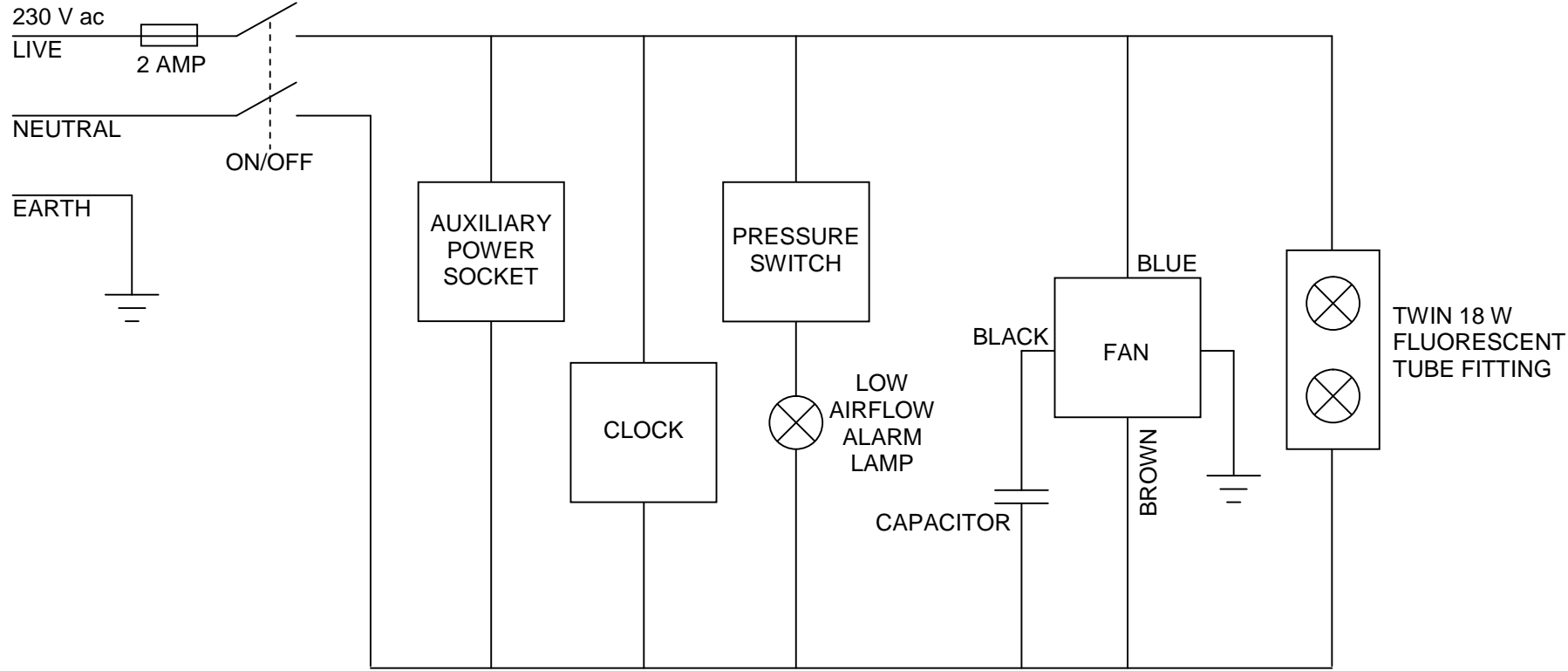
Note:

Paragraph 4 (e) is a "catch-all" section.

- 5 The employer is responsible for assessing the risk to an employee.
- 6 The employer must prevent or control the exposure of an employee to hazardous substances.
- 7 The control of exposure "shall be secured by measures other than the provision of personal protective equipment". This means the fumes must be contained, rather than providing protective suits and masks to staff.
- 8 OEL values must not be exceeded.
- 9 The employer must ensure that safety equipment is properly used.
- 10 The employee must use safety equipment provided correctly.
- 11 The employer must maintain safety equipment in good working order; in particular:
 - (a) Exhaust ventilation equipment must be examined every 14 months.
 - (b) Other safety equipment must be examined at "suitable intervals".
 - (c) Records of checks, tests and repairs must be kept for 5 years.
- 12 Monitoring of exposure to hazardous substances must occur "in accordance with a suitable procedure". Records of results must be kept for 5 years for general monitoring and for 30 years when they relate to a specific employee.

- 13 Regular medical checks are required when working with certain listed substances, or where an identifiable disease is associated with a certain substance.
- 14 An employer must provide suitable instruction and training to employees regarding risks of substances and precautions to be taken.
- 15 Certain other regulations take precedence, such as Control of Lead at Work, Control of Asbestos at Work, radioactive, explosive or flammable regulations, Mines and Quarries Act, and medical treatment regulations.

APPENDIX 2 - ELECTRICAL DIAGRAM



APPENDIX 3 - LOW AIRFLOW ALARM - TESTING AND CALIBRATING

WARNING:

CALIBRATION OF THE PRESSURE SWITCHES INVOLVES REMOVING THE COVER OF THE ELECTRONIC ENCLOSURE, EXPOSING ELECTRICAL CONTACTS AT MAINS VOLTAGE. THE PRESSURE SWITCHES ARE ALSO MAINS OPERATED. THE ADJUSTMENT MUST ONLY BE MADE BY A SUITABLY QUALIFIED PERSON, SUCH AS AN ELECTRICIAN OR INSTRUMENT TECHNICIAN.

1 TESTING THE LOW AIRFLOW ALARM

- 1.1 Ensure that new pre-filters are fitted in your filtration fume cupboard. Switch on the unit, indicator lamp should be out.
- 1.2 Switch off unit. Block the pre-filters to give an airflow of <0.3 m/s. Switch on. The red indicator lamp will start to flash.
- 1.3 If a malfunction is indicated by steps 1.1 or 1.2, then a pressure switch calibration procedure may be required. Details are provided below. Remember to remove the plastic bags from the pre-filters before returning the unit to routine use!

2 CALIBRATION PROCEDURE

- 2.1 The low airflow alarm operates using a differential pressure switch detects a 'high vacuum' situation caused by a blocked pre-filter. The pressure switch is carefully calibrated before leaving our factory, and in the majority of cases calibration will not be required.
- 2.2 The factory calibration is carried out using a standard GP filter at 240, 220 or 110 volts 50 Hz mains supply, depending on the market area. A standard Filtrete pre-filter is used. If the end-user is known (e.g. school) then the calibration will be performed using the correct main filter in place (e.g. EDU filter).
- 2.3 In some cases it may be necessary to recalibrate the pressure switch in the customer's laboratory if the test procedure described above fails. The main reason for a test failure are:
 - (a) A severe knock during transport.
 - (b) A change in the mains voltage or frequency.
 - (c) Use of a different main filter from the used during factory calibration.

The pressure switch is located behind the control panel.

NOTE the warning at the top of this page concerning electrical hazards

- 2.4 The pressure switch is located by removing the grommet in the front control panel, and carefully inserting a screwdriver to locate the control screw.

- 2.5 The filtration fume cupboard should be fitted with main filter and new Filtrete pre-filter. Switch on. Wait 30 seconds to warm up.
- 2.6 Unscrew (anticlockwise) switch by 2 turns. The red warning light should now be off.
- 2.7 Screw switch clockwise until the red warning light JUST comes on.
- 2.8 Unscrew switch by 5 degree (half hour on the Hour hand of a clock) so the red warning light goes out.
- 2.9 Check calibration by switching the unit off, and wrap the pre-filter in a plastic bag and replace in the unit. Switch on. The warning light should come on. Remember to remove the plastic bag before returning to routine use!!

It should be noted that the alarm is NOT an ON/OFF device, but will start to flicker as the pre-filter progressively blocks with dust.

APPENDIX 4 - FILTER SATURATION ALARM - TESTING AND CALIBRATION

1 TESTING

- 1.1 Switch on the unit, the green indicator lamp comes on.
- 1.2 Release the filter clamp.
- 1.3 Place a small amount of alcohol (isopropanol) on a tissue and hold above the filter to introduce the fume into the airstream. The red indicator lamp should come on and the audible alarm sound.
- 1.4 If a malfunction is indicated by steps 1.1 or 1.2, then a calibration procedure may be required. Details are provided below. Remember to remove the tissue before returning to routine use!!

2 CALIBRATION

The detector has been set up in the factory before delivery. However the unit may require a slight adjustment in some environments.

- 2.1 Remove the Control Head.
- 2.2 The Gas Sensor Board is located adjacent to the Control Panel inside the Control Head.
- 2.3 Using a multimeter, monitor the voltage at the test point between the gas sensor and the potentiometer and adjust to give 2.3 V.

APPENDIX 5 – CARE AND CLEANING

1 STAINLESS STEEL COMPONENTS

Considerable care has been taken in the selection and processing of the stainless steel components used in the construction of this equipment, however even stainless steel can be damaged by chemical attack.

It is therefore important to ensure that any cleaning or disinfecting procedures used will not cause a chemical attack that may damage the surface of the stainless steel. Work surfaces should be kept clean and free of chemical liquids, particularly those containing Chlorine.

Liquids or vapours containing Chlorine are known to cause gradual staining of stainless steel. To avoid this, when chemicals are used containing Chlorine all surfaces should be thoroughly dried and all traces of the solution removed, the area should then be treated with a neutralising agent. Open vessels left inside the equipment which are likely to cause Chlorine vapours may also result in staining of the metal surfaces.

Should the surface of the stainless steel become stained, it may be cleaned by mechanical polishing and special treatment of the affected area. Our service department can help with this process.

2 PLASTIC COMPONENTS

Cleaning of the plastic items should only be carried out with mild detergent or chlorine based cleaning solutions. Care must be taken not to apply chlorine solutions to any stainless steel metalwork, as this will potentially cause staining.

Do not apply heat, abrasive materials, solvents or solvent wipes to the surface as this can cause irreparable damage.

3 PAINTED AND OTHER COMPONENTS

Caution:

Do not use water around electrical connections, switches etc.

To clean all painted and other components use a damp cloth and, when required, a liquid detergent.

Note:

Do not use abrasive cleaners or chlorine based cleaning products.

APPENDIX 6 – CE CERTIFICATE

***EC DECLARATION OF CONFORMITY
FOR ATTACHMENT OF 'CE' MARK***



We, the manufacturer: BIOQUELL UK Limited.
52 Royce Close
Portway Industrial Estate
Andover, Hampshire
SP10 3TS
Tel: +44 (0) 1264 - 835835
Fax: +44 (0) 1264 - 835836

Declare under our sole responsibility that the appliance:

EDU 96 SCHOOLS MOBILE FUME CUPBOARD

Serial Number as stated on Certificate of Factory Testing

Complies with the Protection Requirements of the Electromagnetic Compatibility Directive 2004/108/EC and the Machinery Directive 2006/42/EC by means of the following standard:

BS EN 61326-1 : 2006

Tested By: TRaC, Holly Grove Farm,
Verwood Road, Ashley, Ringwood, Hants, BH24 2DB –
Certificate No. 6621/09

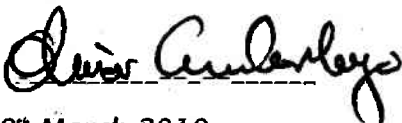
Other harmonized standards used:

EN 61010 : 2001

Responsible Person :-

Name :- O.R.Cumberlege

Position :- Director

Signed:- 

Date:- 10th March 2010.

APPENDIX 7 WARRANTY INFORMATION

BIOQUELL UK Ltd. produces products that are warranted under normal usage against defects in workmanship and materials for one-year parts and labour costs, from the date of manufacture. The Warranty is stated in the Standard Terms and Conditions of sale.

Export and Agent retailed products are warranted directly by the Agent. Please confirm your warranty and liability status with the Agent.

In addition, the Warranty is void unless the following conditions are met:

- (a) The product has been installed and used as stated within the Instruction Manual.
- (b) **The warranty does NOT include servicing or maintenance.** An approved service company who have attended our training courses for your product must carry out maintenance of product. Failure to maintain or service this product will invalidate the warranty. Maintenance must be carried out in accordance with the Service Manual and include tasks within stated periods. Failure to use approved service companies or BIOQUELL UK Ltd. trained personnel for maintenance also affects the CE Marking status of the product, removing BIOQUELL's Duty of Care and responsibility
- (c) Consumables such as: pre-filters, main filters, light bulbs and tubes, not warranted.
- (d) This Warranty is void if faults are caused by accidental damage, mishandling, adjustment by unauthorised personnel or failure to follow the correct maintenance and safety precautions as stated in the Instruction Manual.
- (e) The Warranty expressly provided for herein is the sole Warranty provided in connection with the product and no other Warranty, expressed or implied, is provided. BIOQUELL UK Ltd. assumes no responsibility for any other claims, consequential (including lost time or profit) or other damage, whether based in contract, tort or otherwise, not specifically stated in this Warranty.
- (f) Except in respect of death or personal injury caused by Seller's negligence, or as expressly provided in these Conditions, Seller shall not be liable to Buyer by reason of any representation (unless fraudulent), or any implied warranty, condition or other term, or any duty at common law, or under the express terms of the Contract for any loss of profit or any indirect, special or consequential loss, damage, costs, expenses or other claims (whether caused by the negligence of Seller, its servants or agents or otherwise) which arise out of or in connection with the supply of the Goods or their use or resale by Buyer, and the entire liability of Seller under or in connection with the Contract shall not exceed the price of the Goods.

Note:

When requesting a Warranty visit, please have the following information available:

- (i) Product model number and name.
- (ii) Serial number.
- (iii) Date of last service, and Service Company.
- (iv) Nature of fault and any other comments likely to indicate cause of fault.
- (v) A Purchase Order number to cover costs incurred if visit is outside the scope of the Warranty.

BIOQUELL UK Ltd., or other nominated personnel will carry out warranty visits.

- (g) In the event of any health and safety incidents please advise us in writing at the earliest opportunity.
- (h) This warranty and all other contractual issues shall be governed by English law and the parties agree to submit to the nonexclusive jurisdiction of the courts of England.